REMARKS/ARGUMENTS

After the foregoing amendments, claims 1-18 and 20-39 are currently pending in this application. New claims 35-39 have been added to more distinctly claim subject matter which the Applicants regard as the invention. Applicants submit that no new matter has been introduced into the application by these amendments.

Claim Rejections - 35 USC §102(e)

Claims 1-18 and 20-34 stand rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,725,331 to Kedem (hereinafter "Kedem").

Kedem relates to a method and apparatus for managing the dynamic assignment of physical resources in a data storage system (column 2, lines 13-17). An example of a dynamic assignment of a physical resource is utilizing a storage device as a "hot spare" to replace a failing storage device (column 1, lines 58-61). Kedem utilizes pairs of disk adapters to control drives; in the event of a failure of one adapter of the pair, the other can take over (column 4, lines 53-56). The adapters use configuration tables to track system resources, such as the disk adapter number, the logical volume number, and the mirror number (column 3, line 53 to column 4, line 8 and column 5, lines 1-18).

As described in column 6, lines 7-25:

> A DC/BCV volume can be used to establish a logical "connection" with another logical volume. The DC/BCV volume is used to make at least one additional copy or mirror of the logical volume to which it is logically connected. After the copy is made, the storage system may de-establish the connection to create a snapshot of the contents of the copied logical volume at a particular point in time. The snapshot copy can then be used to perform various operations (e.g., making a backup of the data or generating a report based on its contents) without disrupting or holding up access to the logical volume that was copied. When the desired operations have been completed, the logical connection between the DC/BCV logical volume and the copied logical volume may be reestablished, so that the DC/BCV volume can be updated with all changes that occurred to the copied volume while the logical connection had been de-established. In this manner, the DC/BCV volume can be used to provide a copy of the logical volume at a later point in time.

Because the DC/BCV is disconnected from the logical volume for periods of time, the DC/BCV is not able to provide continuous data protection as recited in the present application. The "snapshot" as used by Kedem is used to perform operations that would otherwise disrupt access to the logical volume. In contrast, a "snapshot" as defined by the present application is used to restore the system to a particular point in time.

To manage the dynamic assignment of resources in a storage system, Kedem discloses a method of creating a global table to store information on all dynamic resource assignments in the system, creating a local table in each controller which includes a copy of the global table, and controlling the dynamic assignment of resources using the local table (column 9, line 55 to column 10, line 3).

The Examiner's arguments based on Kedem are not supportable by Kedem. First, the Examiner argues that column 5, line 66 to column 6, line 4 and column 6, lines 11-13 and 25-30 of Kedem disclose continuous data protection. As discussed above, Kedem describes that the DC/BCV is not always connected to the logical volume which it copies; therefore, the data protection cannot be continuous. The Examiner argues that because Kedem states that the storage system "may" be disconnected from the DC/BCV, this implies that Kedem discloses continuous data protection. Applicants respectfully disagree with this assertion. As clearly stated in column 6, lines 17-23,

> When the desired operations have been completed, the logical connection between the DC/BCV logical volume and the copied logical volume may be reestablished, so that the DC/BCV volume can be updated with all changes that occurred to the copied volume while the logical connection had been de-established.

If the DC/BCV was providing continuous data protection, it would not need to be "updated with all changes that occurred to the copied volume while the logical connection had been de-established". Kedem does not disclose or suggest how the DC/BCV would operate if it was not disconnected from the other logical volume.

Furthermore, as stated in column 6, lines 25-29,

> Alternatively, once the need for the point-in-time copy of the logical volume ceases, the DC/BCV volume can be dynamically assigned to another logical volume, or can be kept idle and available for use to make a point-in-time copy of another logical volume.

If Kedem were providing continuous data protection, the DC/BCV would have to, by definition of the term "continuous", always be connected to the logical volume. Since the foregoing clearly states that the DC/BCV can be dynamically assigned to another logical volume or be kept idle, the DC/BCV cannot provide continuous data protection.

Second, the Examiner argues that column 5, lines 3-13 of Kedem discloses that the secondary volume contains a chronological ordering of all writes made to the primary volume. Applicants respectfully disagree. The Examiner equates mirroring with chronological ordering; these terms are not equivalent. As known to one skilled in the art, a mirror of a drive is an exact copy of the drive, including a copy of the logical structure of the drive. In the present invention, the primary volume can be organized in a logical structure as defined by the storage system. The secondary volume is arranged chronologically and is independent of the layout of the primary volume.

For example, suppose that three writes are made to different files on the primary volume and those writes are made to the locations on the primary volume where the files are located. On the secondary volume, the same three writes are contiguously arranged in chronological order, without a relationship to where on the primary volume the writes are made.

Third, the Examiner argues that column 6, lines 11-25 of Kedem discloses that the primary volume may be restored to any previous point within the APIT (any point in time) window. In particular, the Examiner takes the position that "a later point in time is an instance of any point in time." (Office Action, page 6, last line.)

This position is clearly contradicted by the plain meaning of the language cited by the Examiner; Kedem states that "the DC/BCV volume can be used to provide a copy of the logical volume at a later point in time." (Column 6, lines 23-25, emphasis added.) A later point in time does not cover any point in time within the APIT window. Kedem fails to address the situation of what happens between the time a copy is made to the DC/BCV and the later point in time; the present application is directed to addressing this situation by providing continuous data protection. As discussed above, at column 6, lines 25-29, Kedem describes dynamically reassigning the DC/BCV "once the need for the point-in-time copy of the logical volume ceases".

In regard to claim 1, Kedem fails to disclose all of the elements of claim 1 and therefore does not anticipate claim 1. In particular, Kedem fails to disclose the steps of duplicating the writes made to the primary volume to a secondary volume in a sequential fashion, wherein the secondary volume contains a chronological ordering of all writes made to the primary volume and identifying an APIT window wherein

all writes to the secondary volume are maintained so that within the identified APIT window, the primary volume may be restored to any previous point within the APIT window. Therefore, claim 1 is distinguishable over Kedem. Because claims 2-9 depend from claim 1, claims 2-9 are also distinguishable over Kedem without the need for additional comment.

Kedem does not disclose mapping of the writes between the primary volume and the secondary volume into data structures, as recited in claims 10 and 14. The Examiner argues that "when mirroring takes place, an ordinary person skilled in the art understands that mapping of the two logical volumes must occur for the mirroring to take place." (Office Action, the bottom of page 5 to the top of page 6.) Applicants respectfully disagree. As described above, a mirror of a drive is an exact copy of the drive, including a copy of the logical structure of the drive. Since a mirror drive is an exact copy of a logical drive, no mapping between the two drives needs to occur.

The Examiner argues that Kedem discloses that the entries in the GDAT/LDAT table are used to track the writes (column 17, lines 50-57 and column 18, lines 21-30). The GDAT table is a global table that is used to track the resource assignments and only includes information such as the disk adapter number, the logical volume number, and the mirror number (column 15, lines 57-61). The

individual writes that are made to the volumes are not tracked by Kedem in any way.

The Examiner further argues that "the GDAT/LDAT is merely an illustration of a secondary volume making a point-in-time copy with the primary volume." (Office Action, middle of page 6.) Applicants respectfully disagree. The LDAT is a local dynamic table that "contains information identical to that stored in the GDAT" (column 15, line 66 to column 16, line 5). By these definitions, neither the GDAT nor the LDAT are secondary volumes. The GDAT and the LDAT are used to track a "connection" between a logical volume and a DC/BCV (Figure 7 and column 16, lines 18-35). Neither the GDAT nor the LDAT organize or track writes to either the primary volume or the secondary volume.

Because Kedem fails to disclose all of the elements of claim 10, Kedem does not anticipate claim 10. In particular, Kedem fails to disclose the steps of duplicating the writes to the primary volume in a sequential fashion on a secondary volume, wherein the secondary volume contains a chronological ordering of all writes made to the primary volume; organizing a mapping of the writes between the primary volume and the secondary volume into data structures, wherein the data structures enable the primary volume to be restored to any point in time; and identifying an APIT window wherein the data structures are maintained so that within the identified time window, the primary volume may be restored to any point

within the time window. Therefore, claim 10 is distinguishable over Kedem. Because claims 11-13 depend from claim 10, claims 11-13 are also distinguishable over Kedem without the need for additional comment.

Similar to claim 10, Kedem also fails to disclose all of the elements of claim 14 and therefore does not anticipate claim 14. In particular, Kedem fails to disclose that the secondary volume contains a chronological ordering of all writes made to the primary volume; and a mapping of the data between the primary volume and the secondary volume using data structures, wherein the data structures are maintained so that within an established time window, the primary volume may be restored to any point within the time window. Therefore, claim 14 is distinguishable over Kedem. Because claims 15-18 depend from claim 14, claims 15-18 are also distinguishable over Kedem without the need for additional comment.

In regard to independent claims 20, 21, and 26, similar arguments as those made in connection with independent claims 1, 10, and 14 can be made. Accordingly, claims 20-34 are distinguishable over Kedem without the need for additional comment.

Based on the arguments presented above, withdrawal of the 35 U.S.C. §102(e) rejection of claims 1-18 and 20-34 is respectfully requested.

New claims 35-39 are also distinguishable over Kedem, as Kedem does not disclose duplicating the data to a write log in a sequential order nor does Kedem

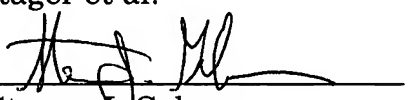
disclose creating a mapping data structure from the write log, the mapping data structure stored on a secondary volume and used to track changes in the data between two points in time, whereby the data is continuously protected.

Conclusion

If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a telephone interview will help to materially advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

In view of the foregoing amendment and remarks, Applicants respectfully submit that the present application, including claims 1-18 and 20-39, is in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,
Stager et al.

By 
Steven J. Gelman
Registration No. 41,034

Volpe and Koenig, P.C.
United Plaza, Suite 1600
30 South 17th Street
Philadelphia, PA 19103
Telephone: (215) 568-6400
Facsimile: (215) 568-6499
SJG/mnr